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# Modelling experiments of the variations of the calving front position of Hansbreen, Svalbard

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## ABSTRACT

Hansbreen is a tidewater glacier in Svalbard, with grounded tongue, about 16 km in length and ca. 2.5 km in width at its tongue. The calving front position has shown, over the recent decades, a general retreating trend, often rather smooth but with some occasional abrupt changes. We apply a full-Stokes model of glacier dynamics, incorporating a crevasse-depth calving model, with the aim of reproducing the glacier front positions observed since 1936 and analyzing the sensitivity of the model to environmental parameters. The model is able to reproduce quite closely the observed front position changes, though not all of the abrupt changes are captured by the model. The amount of water filling the crevasses and the bed geometry act jointly in controlling the front position changes. The front position gently evolves when the front is located in nearly-flat bed areas, while abrupt front position changes occur where the bed shows a sharp change in slope, with different amounts of water implying different timing for the abrupt changes in front position. We have also analyzed the influence of setting the amount of water in crevasses as a function of summer temperature and changes in mass balance function.